KARAN BAIJAL

kb553@cornell.edu | 607-280-5350 | karanbaijal | karanbaijal | Ithaca, NY

Education

Cornell University, Ithaca, NY

- ***Master's in Computer Science***, College of Engineering — GPA: 4.08, Dean's List. Aug 2024 - May 2025
- ***Bachelor's in Physics***, College of Arts & Sciences — GPA: 3.64, Dean's List. Aug 2020 - May 2024
  Minors: Computer Science, Mechanical Engineering

Coursework: Machine Learning (ML), Graduate ML, Deep Learning, Computer Vision, Reinforcement Learning, Robot Learning, Object-Oriented Programming & Data Structures, Functional Programming, Algorithms, Database Systems, Probability & Statistics, Discrete Structures, Statistical Thermodynamics, Mathematical Physics, Multivariable Calculus, Linear Algebra, Differential Equations

Experience

Assistive Robotics Lab, Cornell University — Robotics Machine Learning Researcher Feb 2025 - Present

- Implementing Diffusion control policy, image segmentation for perception, and LLM-based planning for robot sandwich-making.

Assistive Robotics Lab, Cornell University — Robotics Machine Learning Researcher June 2024 - Present

- Architected and implemented an **end-to-end multimodal machine learning pipeline** for **material & object classification** of over 25,000 household objects incorporating vision, language, and haptic time-series data motion, thermal, & force sensors.
- Engineered novel multimodal ML architectures, including a "Haptic" **Transformer** and **multi-encoder temporal convolutional neural net (CNN)**, and fine-tuned Vision-Language models (**OpenAI CLIP, GPT**) with image segmentation techniques, to combine vision and haptic modalities, leading to **47% performance increase** in material recognition in real-world settings over state-of-the-art benchmarks. Used Supervised fine-tuning (SFT) to implement model on different robot embodiments.
- Led large-scale data collection, creating academia's **largest multimodal dataset**, incorporating **feature engineering, speech-to-text recognition**, and **prompt engineering**. Developed **evaluation metrics** pipeline. Submitted paper to RSS conference

Thom-Levy Lab, Cornell University — Particle Physics Machine Learning Researcher Jan 2023 - May 2024

- Trained **machine learning models** using **boosted decision trees** to determine feature importance & differentiate Dark matter signal from Standard Model background events during proton-proton collisions in CERN particle collider.
- Developed a **novel isolation metric** to resolve a flaw in CERN's codebase, **improving performance by 15%**. Wrote Python and C++ code on Fermilab GPU servers as part of a global, multi-collaborative effort. Aiming to submit paper by March 2025.

Corning Incorporated — Robotics Engineering Intern May 2023 - Aug 2023

- Engineered **computer vision** and **sensor-based** error-proofing system for load-unload of 150lb glass preforms by mobile autonomous robots. **Designed experimentation methods** to test solutions under the factory's intense physical constraints.
- **Resolved longstanding bottleneck** for the factory and my team, achieving potential longtime **cost-savings of upto $1,000,000**.

Cornell Autonomous Bicycle Project Team — Robot Navigation Software Team Lead Sept 2020 - May 2023

- **Collaborated cross-functionally** with multiple sub-teams to build a self-balancing, self-navigating autonomous bike.
- Led 3-member team on dynamic obstacle avoidance using **Reinforcement Learning**. Designed **Gazebo simulation** to train algorithm & collect data. Spearheaded testing across different teams to develop functioning bike.

Yu Lab, Cornell University — Quantum Machine Learning Algorithms Researcher Jan 2023 - June 2023

- Developed a recurrent neural network for one-shot construction of optimized quantum circuits for arbitrary state preparation on a superconducting qubit architecture. Generated & post-processed training and testing dataset using IBM Simulators.

Dell Technologies — Software Engineering Intern June 2021 - Aug 2021

- Developed a **product recommendation engine** from proof-of-concept to implementation for Dell Laptops for small businesses.

Projects

Adaptive Task and Motion Planning, AdaTAMP — Robotics Machine Learning Researcher Oct 2024 - Feb 2025

- Developed novel **LLM based adaptive task & motion planning framework** for dynamic correction & multi-agent cooperation. Outperformed prior methods by 14% on long-horizon, multi-agent simulations. Published poster to ICRA Workshop.

Autonomous Fall Detection Wearable, FallUp Medical Device — Founder & Developer Oct 2017 - Sept 2021

- Invented Fallup Healthcare Wearable - an autonomous fall detection and emergency multi-alert wearable for the elderly.
- Awarded **Silver Medal in National Pramerica Community Awards** over 4000+ students and **"Innovator of the Year" Award** for "Creativity and Original Thinking" over 600 students. Interviewed by local radio for building a novel, affordable device.

Skills

Programming Skills: Python, C++, Java, Linux, Git, PyTorch, TensorFlow, Machine Learning (ML), Artificial Intelligence (AI), Wandb, OpenCV, HuggingFace, Robot Operating System (ROS), Kubernetes, OCaml, Qiskit, MATLAB, Docker, SQL, Latex